Memo

Date: Monday, December 01, 2014

Project: Upper Columbia River RI/FS

To: Kris McCaig

From: Teck American Incorporated (TAI) Upper Columbia River (UCR) Project Technical Team

Subject: Recommendations for Long-Term Bioassays

This memo addresses USEPA's October 8, 2014, comments on the samples selected for the long-term bioassays. The purpose of this memo is to clarify the context for long-term toxicity tests and to present the TAI technical team's response to USEPA's suggested changes to the samples selected for testing.

Based on discussions between USEPA and the TAI technical team, and as stated in the Level of Effort (LOE) document dated February 10, 2010 (USEPA, 2010), a sub-set of highly contaminated samples were selected for long-term testing to determine if short-term tests provide a reasonable basis for estimating reproductive effects in midge and/or amphipods in UCR sediment (i.e., results from long-term toxicity tests could help determine if survival and/or growth of midge in 10-d exposures and/or amphipods in 28-d exposures are sufficiently sensitive). The long-term bioassay data generated will be used primarily in a pair wise fashion, comparing the long-term and short-term test results for the same location. For the evaluation of site data compared with reference data, the short-term bioassay study (which includes many more samples than the long-term bioassay study) will provide the primary data set.

With this understanding about the objective of the long-term bioassay tests and how the data will be used to fulfill the study objectives, the TAI technical team agrees to accept most of the locations USEPA requested be used for the long-term bioassays.

Review of Reference Samples

The USEPA and TAI technical teams have agreed to use samples SE-G-1, SE-LAL-3, and SE-LAL-5 as external reference samples. However, the USEPA team proposed alternative samples for SE-G-2, SE-G-4, and SE-LAL-1; substituting SE-G-3, SE-TRIB-3, and SE-REF-10b.

A high TOC reference sample is needed to represent the high TOC end of the spectrum of site conditions. SE-LAL-2 has a TOC of 2.67% and is roughly is equivalent to SE-LAL-1 in terms of TOC. No reference samples other than SE-LAL-1 and SE-LAL-2 cover the high end of TOC. Therefore, the TAI technical team proposes that SE-LAL-2 be included along with SE-LAL-3 and SE-LAL-5 for the lacustrine external reference samples (and accepts removal of SE-LAL-1).

TAI's initial proposal recommended use of three riverine external reference samples (SE-G-1, SE-G-2, and SE-G-4). TAI's technical team accepts USEPA's recommendation to include sample SE-G-3 from this area and remove sample SE-G-4. The rationale provided by the USEPA team for excluding sample SE-G-2 is that *Hyalella* growth in the associated control was less than the goal of 0.4 mg dry weight/organism established for control organisms. USEPA has not established test acceptability criteria for 28-day *Hyalella* weight and although the weight goal was not reached by control organisms, survival was high (96%). Hyalella survival and weight in sample SE-G-2 relative to control results was 92% for survival and

86% for weight. Therefore, the TAI technical team recommends retaining SE-G-2 as a riverine external reference sample.

With USEPA team comments and this discussion in mind, the TAI technical team's recommended set of external reference samples for long-term bioassay analysis is SE-G-1, SE-G-2, SE-G-3, SE-LAL-2, SE-LAL-3, and SE-LAL-5. TAI agrees to include SE-TRIB-3 (tributary) and SE-REF-10b (internal reference) samples to obtain long-term bioassay data from these types of locations. Their inclusion is described below.

Expanded Experimental Design

The TAI technical team agrees to add sample SE-4-B6 as a site sample per USEPA's suggestion. SE-TRIB-3 and SE-REF10-b would be included in one of the batches (i.e., as two additional site samples rather than include them with each batch as will be done for the six external reference samples). The inclusion of samples SE-4-B6, SE-TRIB-3, and SE-REF-10b will be in addition to the 18 site samples originally proposed and accepted by USEPA. The TAI technical team proposes modifying the long-term bioassay study experimental design so that samples will be run in three (3) batches, with controls (PER control sediment and quartz sand), six (6) external reference samples, and seven (7) other samples in each batch. A summary of the proposed samples for inclusion is provided in the table below. *Sequencing of samples for long-term bioassays (i.e., identification of which samples would be processed in each batch) will be developed once the list of samples for analysis is approved.*

Proposed Samples

Test Samples	SE-1-B5, SE-1B-R2, SE-1-R2, SE-2-B1, SE-2-R1, SE-3-B3, SE-3-R7, SE-3-R8, SE-4-B1, SE-4-B5, SE-5-B2, SE-5-B4, SE-6-B2, SE-6-B5, SE-7-B2, SE-7-B5, SE-8-B2, SE-8-B3, SE-4-B6, SE-TRIB-3, and SE-REF-10b.	Each sample run once in one of three batches
External Reference Samples	SE-G-1, SE-G-2, SE-G-3, SE-LAL-2, SE-LAL-3, and SE-LAL-5	Each sample run once in each batch of three batches

References

USEPA. 2010. EPA Technical Team Level of Effort (LOE) for Investigations Designed to Evaluate Risks of Contaminants to Benthic Invertebrate Communities in the Upper Columbia River (Sediment Toxicity LOE). U.S. Environmental Protection Agency, Region 10, Seattle, Washington. Dated: February 10, 2010.